

Jpn. J. Ent., **62** (3): 537–554. September 25, 1994

Six New Species of the Drosophilidae (Diptera) from Eastern China

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Abstract Six new species of the Drosophilidae, each one of the genera *Stegana* MEIGEN, *Leucophenga* MIK, *Microdrosophila* MALLOCH and *Mycodrosophila* OLDENBERG and two of the genus *Liodrosophila* DUDA, are reported from eastern China, along with designating three new synonyms of Chinese drosophilids.

Key words: Drosophilidae; new species; new synonyms; eastern China.

Recently, ZHANG *et al.* (in press) catalogued about 500 species on a list of Chinese drosophilids, compiling the records of known species from all over the China including Taiwan. In comparison to the vast territory of whole China, however, areas where intensive surveys on drosophilid faunas have been made are still quite limited, *e.g.*, Liaoning (WATABE *et al.*, 1993 a), Xinjiang (WATABE *et al.*, 1993 b), Guangdong (PENG *et al.*, 1990), Yunnan (ZHANG, 1989; ZHANG & GAN, 1986; ZHANG & TODA, 1988; etc.) and Taiwan (LIN *et al.*, 1977). We have made several collections of drosophilid flies in some Provinces of eastern China: Anhui, Zhejiang, Fujian and Jiangxi. The records of known species collected from these areas have been incorporated in the catalogue compiled by ZHANG *et al.* (in press). We report here six new species found in Anhui, Zhejiang and Jiangxi Provinces, and further designate three new synonyms of Chinese drosophilids.

Abbreviations of type depositories

EHU: Entomological Institute, Hokkaido University, Sapporo, Japan

GIE: Guangdong Institute of Entomology, Guangzhou, China

IGFU: Institute of Genetics, Fudan University, Shanghai, China

NSMT: National Science Museum (Nat. Hist.), Tokyo, Japan

Genus *Stegana* MEIGEN

Stegana MEIGEN, 1830, Syst. Besch. europ. zweifl. Insekt., **6**: 79; WHEELER 1960, Proc. ent. Soc. Wash., **62**: 109; OKADA, 1989: 396; TODA & PENG, 1992: 209. Type species: *Stegana nigra*

MEIGEN, 1830 (designated by ZETTERSTEDT, 1847, *Diptera Scandinaviae*, **6**: 2577).
Protostegana HENDEL, 1920, *Wien. ent. Zeit.*, **38**: 53. Type species: *Drosophila curvipennis* FALLÉN, 1823.

The generic diagnosis was given by OKADA (1989; in the style of key) and TODA & PENG (1992).

Subgenus *Oxyphortica* DUDA

Oxyphortica DUDA, 1923, *Annls. hist.-nat. Mus. natn. hung.*, **20**: 34 (as subgenus of *Phortica*);
 OKADA, 1971: 94; TODA & PENG, 1992: 210. Type species: *Drosophila convergens* DE MEIJERE, 1911.

Chaetocnema DUDA, 1926, *Annls. hist.-nat. Mus. natn. hung.*, **23**: 242 (preoccupied by *Chaetocnema* STEPHENS, 1831, in *Coleoptera*). Type species: *Chaetocnema (Oxyphortica) poecioptera* DUDA, 1926.

Diagnosis (after OKADA 1971, 1978; TODA & PENG, 1992). M_1 distally weakly curved forward; maximum diameter of eye perpendicular to body axis; postgena narrow, linear; wing nearly entirely dark fuscous, not curved down in resting posture; scutellum flat, marginally ridged; frons and face marking obtuse angle in profile.

Stegana (Oxyphortica) meichiensis sp. nov.

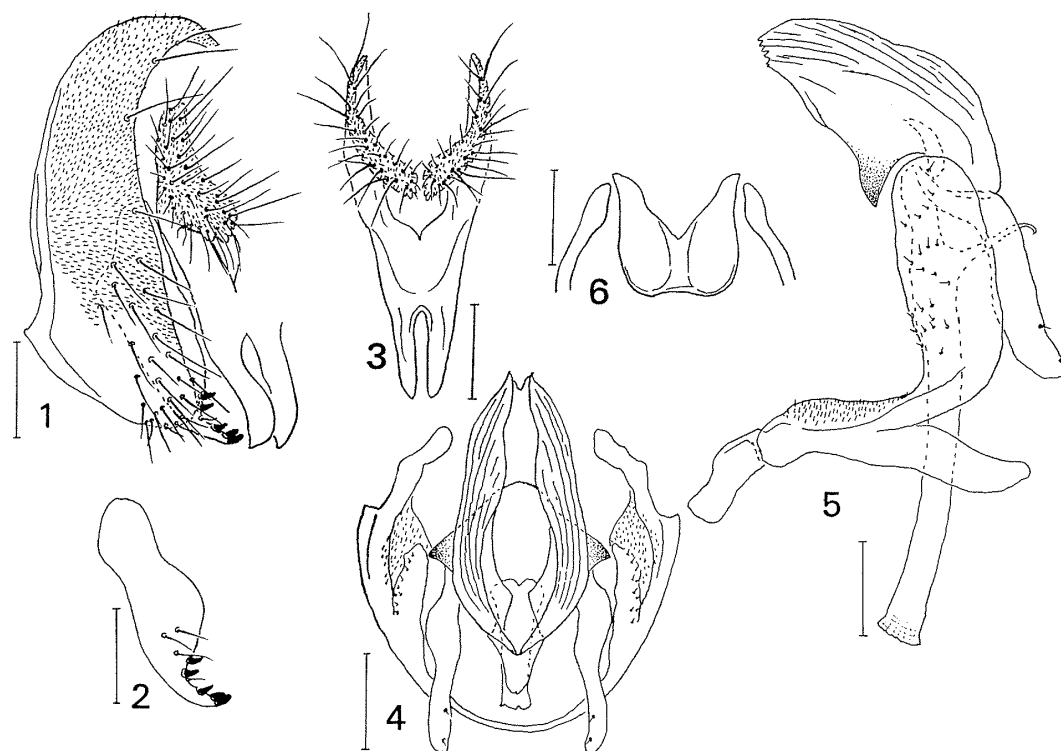
(Figs. 1–6)

Diagnosis. Cercus ventrally with bare, long processes which are medially fused to each other (Fig. 3); mid katapisternal seta stout, long, *ca.* 0.89 as long as posterior; mid tibia without stout setae dorsoproximally; frons with many interfrontal setulae; costa extending beyond tip of R_{4+5} ; bm-cu crossvein absent.

♂. Head: Eye brownish red. Ocellar triangle dark brown, marginally pale brown. Postocellar setae present. Frontal vitta grayish brown. Fronto-orbital plate pale brown, *ca.* 1/2 as long as frons. Anterior reclinate orbital seta stout. Face pale brown in upper 2/3, dark grayish brown in lower 1/3; carina prominent, narrow in upper part, broad and strongly convex in lower part, but not reaching to buccal margin. Clypeus dark brown. Gena grayish yellow. Postgena and occiput dark grayish brown. Pedicel grayish yellow, with *ca.* 2 stout setae and several setulae; 1st flagellomere pale gray; arista without terminal bifurcation. Palpus grayish yellow, lateroventrally with several short setae.

Thorax yellowish brown; diffuse, grayish brown patches present on anepimeron and anterior part of katapisternum. Postpronotal lobe slightly darker, with *ca.* 5 stout setae. Acrostichal setulae in *ca.* 10 irregular rows. Basal scutellar setae divergent.

Wing: Veins dark brown; crossveins clear. R_{2+3} slightly curved to costa at tip. C_1 seta 1. Third costal section with *ca.* 3–5 small warts on underside. Halter grayish white; stem darker.



Figs. 1–6. *Stegana (Oxyphortica) meichiensis* sp. nov. — 1, Epandrium, surstylus and cercus (caudolateral view); 2, surstylus; 3, cercus (caudal view); 4, hypandrium, parameres and aedeagus (ventral view); 5, ditto (lateral view); 6, gonopod. (Scale-line=0.1 mm)

Legs grayish yellow. Apical seta on fore and mid tibiae; preapical dorsals on all tibiae. Mid tarsus with 2 rows of minute cuneiform setulae on underside. Fore 1st tarsomere slightly shorter than the rest tarsomeres together; mid 1st tarsomere slightly longer than the rest together; hind 1st tarsomere as long as the rest together.

Abdomen: First tergite entirely pale yellow; 2nd mostly pale yellow, with narrow, dark brown, caudal band; 3rd to 5th anteromedially yellow, caudally dark grayish brown; 6th nearly entirely dark grayish brown. Sternites grayish brown, longer than broad.

♂ terminalia: Epandrium (Fig. 1) somewhat narrow medially to dorsally, broadened below, pubescent except for ventral part, with *ca.* 29 setae; anteroventral corner prominent. Surstylus (Fig. 2) long, distally narrowing and with *ca.* 5 prenisetae and 1 seta on inner margin and *ca.* 3 setae on outer surface. Cercus (Figs. 1, 3) separated from epandrium; dorsal lobe small, narrow above, nearly entirely pubescent, with *ca.* 37 setae on entire surface and several warts on caudoventral margin. Hypandrium (Figs. 4, 5) narrow, arcuate, caudolaterally pubescent, laterally with 1 pair of large, long, vertical flaps each bearing *ca.* 22 setulae. Aedeagal guide (Figs. 4, 5) apically pointed and recurved, small flap. Gonopod (Fig. 6) basally

deeply triangularly notched, seemingly bilobed; lateral ends contiguous to caudal ends of hypandrium. Paramere (Figs. 4, 5) elongate, thin plate, distally with *ca.* 2 setulae. Aedeagus (Figs. 4, 5) robust, bilobed ventrally and apically, with many wrinkles on lateroventral surface and 1 pair of somewhat triangular expansions dorsobasally; apodeme *ca.* 2 times longer than aedeagus.

Measurements: BL (body length)=3.26 mm, ThL (thorax length)=1.40 mm, WL (wing length)=2.66 mm, WW (wing width)=1.13 mm.

Indices: arb (dorsal branches of arista/ventral branches of arista)=6–7/4, FW/HW (frontal width/head width)=0.48, ch/o (maximum width of gena/maximum diameter of eye)=0.15, prorb (proclinate orbital/posterior reclinate orbital)=0.95, rcorb (anterior reclinate orbital/posterior reclinate orbital)=0.51, vb (subvibrissal/vibrissa)=0.64, dcl (anterior dorsocentral/posterior dorsocentral)=0.47, presctl (prescutellar/posterior dorsocentral)=0.69, orbito (distance between proclinate and posterior reclinate orbitals/distance between inner vertical and posterior reclinate orbital)=1.68, dcp (length distance between ipsilateral dorsocentrals/cross distance between anterior dorsocentrals)=0.25, sctlp (distance between ipsilateral scutellars/cross distance between apical scutellars)=1.10, C=3.67, 4c=0.62, 4v=1.64, 5x=1.00, ac=2.79, M=0.36, C3F=0.73.

Holotype ♂, China: Meichi, Litingwu, Zhejiang, 14–17. V. 1991 (IGFU).

Distribution. China: Zhejiang.

Relationship. This species is very interesting to consider the relationship among subgenera of the genus *Stegana*, bearing the mixture of diagnostic characters of several subgenera. The absence of stout setae on proximal part of mid tibia is a diagnostic character by which the subgenera *Parastegana* OKADA and *Pseudostegana* OKADA are distinguished from the other subgenera. On the other hand, many other characters are common to the subgenus *Oxyphortica*, but setigerous frons is a diagnostic character of the subgenus *Orthostegana* HENDEL. Thus, this species may be a link species connecting several *Stegana* subgenera with each other, and presumably should be assigned to a new subgenus. There is, however, some discrepancy between taxonomic positions and phylogenetic relationships in some *Stegana* subgenera and the genus *Eostegana* HENDEL, as pointed out by GRIMALDI (1990). We refrain from establishing a new subgenus by the present species and provisionally include it in the subgenus *Oxyphortica* to avoid further confusion, until phylogenetic relationship among *Stegana* subgenera and *Eostegana* is settled by a full revision of this group.

Etymology. Pertaining to the type locality.

Genus *Leucophenga* MIK

Leucophenga MIK, 1886, Wien. ent. Zeit., 5: 317. Type species: *Drosophila maculata* DUFOR, 1839. *Oxyleucophenga* HENDEL, 1913, Ent. Mitt., 2: 386. Type species: *Oxyleucophenga undulata* HENDEL, 1913.

Drosomyiella HENDEL, 1914, Suppl. ent., 3: 113. Type species: *Drosophila abbreviata* DE MEIJERE,

1911.

Paraleucophenga OLDENBERG, 1914, Arch. Naturg., **80A** (2): 18 (preocc. HENDEL, 1914). Type species: *Leucophenga quinque maculata* STROBL, 1893, by monotypy.

Neoleucophenga OLDENBERG, 1915, Arch. Naturg., **80A** (9): 93 (new name for *Paraleucophenga* OLDENBERG). Type species: *Leucophenga quinque maculata* STROBL, 1893, automatic.

Ptyelusimyia SEGUY, 1932, Encyclopedie Ent., Ser. B, Diptera, **2**: 93. Type species: *Ptyelusimyia decaryi* SEGUY, 1932.

Drosophilopsis SEGUY, 1951, Mem. Inst. Sci. Madagascar, **5** (A): 310. Type species: *Drosophilopsis scaevolaevora* SEGUY, 1951.

Diagnosis (after GRIMALDI, 1990). Proclinate and anterior reclinate orbital setae very close together, separated by distance less than 1/2 of that between anterior reclinate and posterior reclinate; gonopods fused with each other, forming somewhat triangular plate, anteroventrally with apically curved median rod; surstylus squared, flat, broad.

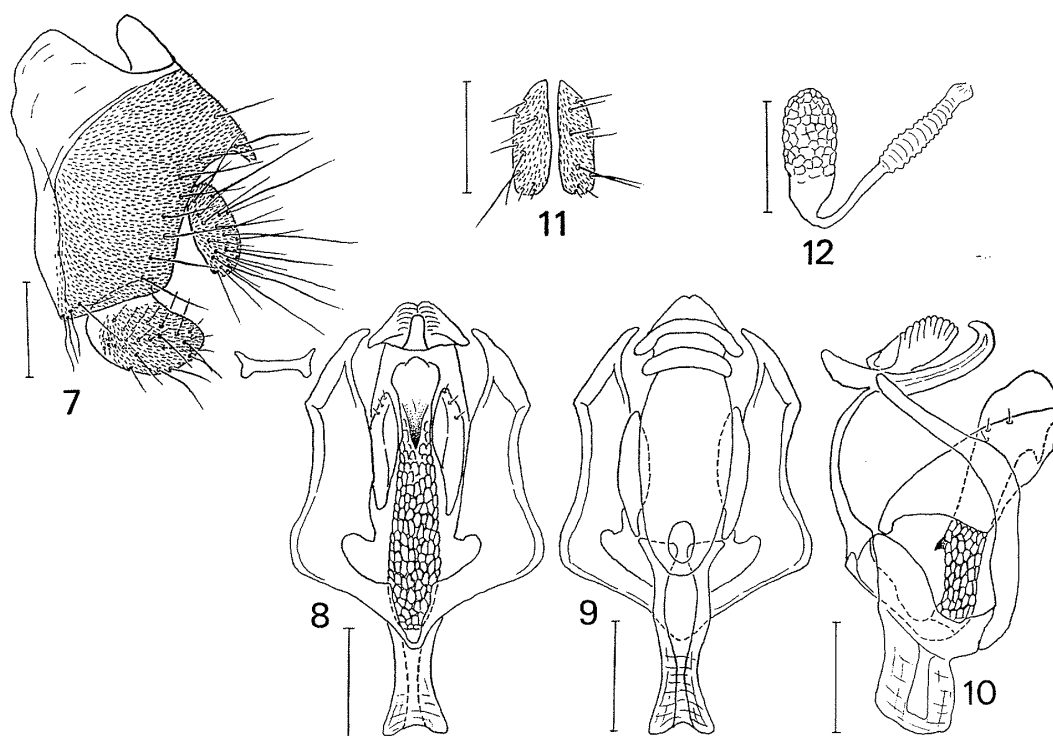
There has been some uncertainty in the homology of some parts of ♂ terminalia between the genus *Leucophenga* and other groups. GRIMALDI (1990) referred to an organ lying over aedeagus as folded, dorsal process, and recognized this structure as an autapomorphy of the genus *Leucophenga*. OKADA (1968, etc.), however, termed it posterior paramere. The relative position of this organ, *i.e.*, bridging the caudal ends of hypandrium, strongly supports OKADA's interpretation. The homologous organ bridging the caudal ends of hypandrium is seen in many other steganine genera (cf. TODA & PENG, 1990, 1992), and has been termed posterior paramere. We, however, call it here gonopod according to the terminology revised by ZHANG and TODA (1992). The apically curved, median rod of gonopod (hooked piece, OKADA, 1966; der Haken, BÄCHLI, 1971) is homologous to 'dorsal mantle' (OKADA, 1977) and vertical lobe (TODA & PENG, 1992) of posterior paramere in the subgenera *Phortica* SCHINER and *Amiota* LOEW, respectively. OKADA (1968) established the homology of 'dorsal process' connecting gonopod to aedeagus between the genera *Leucophenga* and *Microdrosophila* MALLOCH, tracing the route of ejaculatory duct into aedeagus. This process seems homologous to bridge between the bases of 'dorsal mantle' and aedeagus in the subgenus *Phortica* (TODA & PENG, 1990), and is termed here dorsal bridge. Furthermore, a process connecting the dorsal bridge and the base of aedeagus seems homologous to a rod connecting aedeagal apodeme and the base of aedeagus in the subgenus *Phortica* (TODA & PENG, 1990).

***Leucophenga sculpta* sp. nov.**

(Figs. 7–12)

Diagnosis. Aedeagus with large, hook-like projection ventro-subapically and moderate, claw-like projection dorso-subbasally (Fig. 10); paramere bare on inner surface.

♂, ♀. Head: Eye dark red. Ocellar triangle dark brown. Frontal vitta dark grayish brown, anteriorly pale yellow and with a few interfrontal setulae. Fronto-



Figs. 7–12. *Leucophenga sculpta* sp. nov. — 7, Epandrium, surstylus, cercus and 10th sternite; 8, hypandrium, parameres, gonopod and aedeagus (ventral view); 9, hypandrium, parameres, gonopod, dorsal bridge and aedeagal apodeme (dorsal view); 10, hypandrium, paramere, gonopod, dorsal bridge and aedeagus (lateral view); 11, oviscaps (8th sternites); 12, spermatheca. (Scale-line=0.1 mm)

orbital plate pale brown. Face pale brown; carina less developed. Clypeus dark brown. Gena pale yellow, darker around anteroventral corner; subvibrissal seta not differentiated. Postgena and occiput dark grayish brown. Pedicel grayish brown, with *ca.* 1 stout seta and several setulae; 1st flagellomere grayish yellow; arista with small terminal bifurcation. Palpus slender in both sexes, dark gray, with several setae subapically and laterally.

Thorax: Postpronotal lobe pale yellow, with 1 stout, very long seta. Scutum yellowish to grayish brown. Scutellum yellowish to grayish brown, apically paler. Thoracic pleura pale yellow, with broad, dark brown, longitudinal stripe running from propleuron to base of halter. Acrostichal setulae in *ca.* 10 irregular rows. Basal scutellar setae divergent; apicals crossed each other.

Wing hyaline, with 4 large, dark brown patches on r-m and dm-cu crossveins, subbasal region below subcostal break and subapical region around distal part of R_{2+3} to submedial part of R_{4+5} . Veins yellowish brown. R_{2+3} slightly curved to costa at tip. R_{4+5} and M_1 distally slightly convergent. C_1 setae 2, subequal. Third costal section with *ca.* 5–8 small warts on underside. Halter white.

Legs pale yellow; mid and hind knee joints slightly darker. Apical setae and

preapical dorsals on all tibiae. Mid tarsus with 2 rows of minute cuneiform setulae on underside. All 1st tarsomeres longer than the rest tarsomeres together.

Abdomen: In ♂, tergites nearly entirely black; 2nd with 1 pair of small, yellow spots near lateral margins; 3rd anteriorly narrowly yellow. In ♀, 1st tergite nearly entirely pale yellow, with 1 pair of grayish brown patches on lateral margins; 2nd largely black except for anteromedial, pale yellow portion and 1 pair of yellow patches near lateral margins; 3rd pale yellow, with broad, black caudal band protruding medially and laterally; 4th mostly black, submedially with 1 pair of yellow patches; 5th nearly entirely black. Sternites small, pale gray; 7th dark gray.

♂ terminalia: Epandrium (Fig. 7) broad, truncate below, entirely pubescent, with *ca.* 8 setae near caudal margin and *ca.* 4 around anteroventral corner; anteroventral corner prominent; apodeme well developed. Surstylus (Fig. 7) ovoid, broader than long, nearly entirely pubescent on outer surface except for anterior margin, with *ca.* 7 setae on outer surface and *ca.* 20 on inner surface. Tenth sternite (Fig. 7) transverse bar with somewhat expanded, lateral ends. Cercus (Fig. 7) separated from epandrium, elliptical, entirely pubescent, with *ca.* 28 setae. Hypandrium (Figs. 8, 10) arcuate, laterally broad, anterodorsally fused to aedeagal apodeme, without paramedian setae. Gonopod (Figs. 8, 10) wrinkled on dorsal surface; lateral ends contiguous to caudal ends of hypandrium; anteroventral median rod longer than gonopod. Paramere (Fig. 10) apically pointed, ventromedially triangularly expanded, with *ca.* 3 setulae near dorso-submedial margin. Aedeagus (Figs. 8, 10) with scaly sculpture on nearly entire surface except for apical portion; apodeme well developed, dorsally bilobed, caudally forming 1 pair of broad plates each apically contiguous to base of paramere. Dorsal bridges (Figs. 9, 10) completely fused to each other, forming broad, thin plate anteriorly with hole for insertion of ejaculatory duct.

♀ terminalia: Oviscapts (8th sternites, Fig. 11) paired, small, narrow plates completely separated from each other, entirely pubescent, each with *ca.* 7 setae and *ca.* 3 apical setulae. Spermatheca (Fig. 12) ellipsoidal, black; upper 2/3 of capsule irregularly wrinkled; duct not introverted into capsule, distally narrow and smooth, proximally broad and wrinkled.

Measurements: BL=2.80 mm in the holotype (range in paratypes: 3.53 in ♂, 3.34 in ♀), ThL=1.30 mm (1.69 in ♂, 1.51 in ♀), WL=2.26 mm (3.06 in ♂, 2.71 in ♀), WW=1.02 mm (1.39 in ♂, 1.29 in ♀).

Indices: arb=7 (7–8)/3 (3–4), FW/HW=0.35 (0.35–0.38), ch/o=0.05 (0.04), pror= (0.61–0.63), rcor= (0.72), vb=0.36 (0.34–0.35), dcl= (0.51), presctl= (0.50–0.52), sctl (basal scutellar/apical scutellar)=1.40 (1.30), sterno (anterior katepisternal/posterior katepisternal)= (0.83), orbito= (1.92–2.19), dcp=0.27 (0.30–0.31), sculp=1.20 (1.01–1.13), C=2.09 (1.95–2.16), 4c=1.55 (1.33–1.57), 4v=2.45 (1.96–2.29), 5x=1.09 (1.05–1.14), ac= (3.10–3.78), M=0.60 (0.63–0.64), C3F= (0.81–0.83).

Holotype ♂, China: Jiuhuashan, Anhui, 1. IX. 1991, by sweeping (IGFU).

Paratypes: 2 ♂, 4 ♀, same data as holotype (EHU, IGFU).

Other specimen examined: China: 1 ♂, Conghua, Guangdong, 27. I. 1987, by sweeping.

Distribution. China: Anhui, Guangdong.

Relationship. This species belongs to the *Le. ornata* species-group, and is very close to *Le. ornata* (WHEELER, 1959), but can be clearly distinguished from the latter by the diagnostic characters, *i.e.*, in *ornata*, ventro-subapical projection on distiphallus small, aedeagus dorso-subbasally angled but without claw-like projection, and paramere distally pubescent on inner surface.

Etymology. Referring to the aedeagus with scaly sculpture.

Genus *Amiota* LOEW

Amiota LOEW, 1862, Berl. ent. Zeit., 6: 229. Type species: *Amiota leucostoma* LOEW, 1862.

Subgenus *Phortica* SCHINER

Phortica SCHINER, 1862, Wien. ent. Monatschr., 6: 433; OKADA, 1971, Kontyû, 39: 96; MÁCA, 1977, Acta ent. bohemoslov., 74: 116. Type species: *Drosophila variegata* FALLÉN, 1823.

Amiota (Phortica) pseudopi TODA et PENG, 1990

Amiota (Phortica) pseudopi TODA et PENG, 1990: 45.

Amiota (Phortica) dayanensis CHEN, 1990, J. Fudan Univ. (Nat. Sci.), 29: 85. *syn. nov.*

Specimens examined. China: the holotype of *A. pseudopi*, ♂, Dinghushan, Guangdong, 29. V–7. VI. 1986 (GIE); the holotype of *A. dayanensis*, ♂, Mt. Dayan, Zhejiang, 20. VIII. 1988 (IGFU); 4 ♂, Huangshan, Anhui, 29, 30. VIII. 1991; 5 ♂, Mt. Emei, Sichuan, 16–20. VII. 1992; 3 ♂, Jianfengling, Ledong, Hainan, 23. IX. 1993.

Distribution. China: Anhui (n. loc.), Sichuan (n. loc.), Zhejiang, Guangdong, Hainan (n. loc.).

Remarks. The two specific names were nearly simultaneously published in March, 1990. The date of publication can be specified for *pseudopi* as March 15, 1990, but not for *dayanensis*. The date of publication for the latter name is interpreted as March 31, 1990, according to the Article 21 (b)(i) of the International Code of Zoological Nomenclature. In consequence, the former name is regarded as the senior synonym, and the latter as the junior synonym.

Genus *Microdrosophila* MALLOCH

Microdrosophila MALLOCH, 1921, Entomol. News, 32: 312; OKADA, 1985: 310. Type species: *Drosophila quadrata* STURTEVANT, 1916.

Hopkinsomyia MALLOCH, 1934, Ins. Samoa, Pt. 6, Fasc. 8: 289. Type species: *Hopkinsomyia convergens* MALLOCH, 1934.

Diagnosis (modified from OKADA, 1985). Frons short, *ca.* 1/2 as long as broad;

fronto-orbital plate anteriorly much broadened; anterior reclinate orbital seta fine; subvibrissal seta not differentiated; postpronotal seta only 1; anterior dorsocentral setae situated near transverse suture; 5th tarsomeres thick, with large claws.

Subgenus *Oxystyloptera* DUDA

Oxystyloptera DUDA, 1924, Arch. Naturg., 90A (3): 192; OKADA, 1985: 311. Type species: *Leucophenga tectifrons* DE MEIJERE, 1914.

Diagnosis (modified from OKADA, 1985). Body relatively large; wing tip pointed; subcostal break very deep; aedeagus slender, without ventral recurved process; paramere elongate.

Microdrosophila (Oxystyloptera) falciformis sp. nov.

(Figs. 13, 14)

Diagnosis. Aedeagus apically hooked (Fig. 14); indices: $\text{arb}=8(8)/2(2)$, $\text{sterno}=0.78(0.72)$, $C=1.77(1.73)$.

♂. Head: Eye dark red. Ocellar triangle large, yellow except for dark brown inner margins of ocelli. Frontal vitta yellowish brown, with a few minute interfrontal setulae. Fronto-orbital plate yellow. Proclinate orbital seta situated outside of posterior reclinate. Face yellow; carina narrow, short. Clypeus yellowish brown. Gena yellow. Vibrissa very long, stout. Postgena yellow. Occiput brownish yellow. Pedicel yellowish brown, with 1 stout and 1 moderate setae and several setulae; 1st flagellomere white; terminal bifurcation of arista moderate. Palpus pale yellow, club-shaped, with *ca.* 4 setae apically and several setulae lateroventrally.

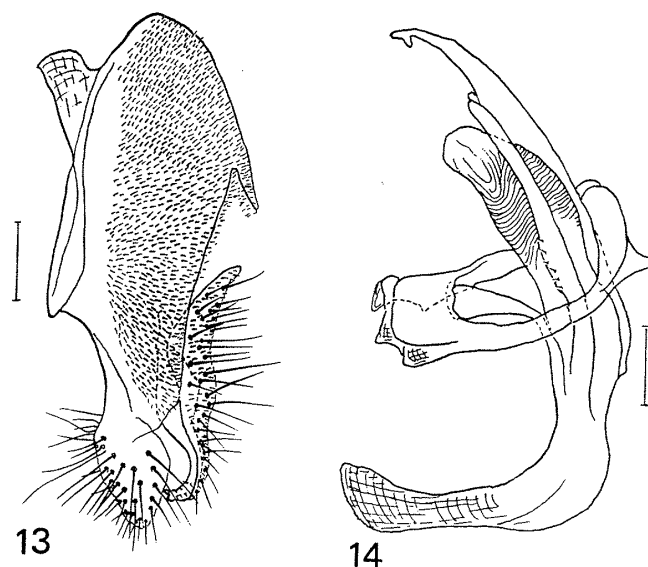
Thorax: Postpronotal lobe brown. Scutum and scutellum yellow. Thoracic pleura pale yellow, slightly brownish above. Acrostichal setulae in *ca.* 10 irregular rows. Basal scutellar setae slightly convergent; apicals crossed each other.

Wing hyline. Veins grayish yellow; crossveins clear. R_{2+3} slightly curved to costa at tip. R_{4+5} and M_1 distally divergent. C_1 setae 2, subequal. Halter pale grayish yellow.

Legs pale yellow. Apical setae and preapical dorsals on all tibiae. Fore and mid 1st tarsomeres each as long as 3 succeeding tarsomeres together; hind 1st tarsomere slightly longer than the rest together.

Abdomen: Tergites pale yellow; 1st laterally brown; 2nd to 5th each with medially interrupted, brown caudal band. Sternites large, pale yellow, broader than long.

♂ terminalia: Epandrium (Fig. 13) much longer than broad, widely pubescent except for anterior margin and ventral lobe; anteroventral corner prominent; ventral lobe somewhat diamond-shaped, densely setigerous. Surstylus (Fig. 13) elongate and curved below, apically bifurcated, subapically with a few spinules. Cercus



Figs. 13, 14. *Microdrosophila (Oxystyloptera) falciformis* sp. nov. — 13, Epandrium, surstylus and cercus; 14, hypandrium, paramere and aedeagus (ventrolateral view). (Scale-line=0.1 mm)

(Fig. 13) separated from epandrium, slender, narrowly elongate below, apically pointed, mostly pubescent except for anterior margin and ventral elongation, with *ca.* 32 setae. Hypandrium (Fig. 14) arcuate; mediobasal part somewhat quadrate; caudal ends forming vertical flaps; aedeagal guide thin, curved, distally widened and contiguous to base of hypandrial median notch. Paramere (Fig. 14) elongate, but shorter than aedeagus, submedially with *ca.* 7 setulae. Aedeagus (Fig. 14) elongate; accessory organ robust, ventrally bilobed, distally with dense, wavy wrinkles on lateral to dorsal surface; apodeme well developed, *ca.* 1/2 as long as aedeagus.

Measurements: ThL=1.13 mm (1.23), WL=2.27 mm (2.21), WW=0.95 mm (0.96).

Indices: FW/HW=0.50 (0.46), ch/o=0.18 (0.16), pror=0.61 (0.61), rcorb=0.20 (0.21), vb=0.30 (0.21), dcl=0.97, sct1=(1.06), orbito=0.45 (0.39), dcp=0.72 (0.83), sctlp=1.27 (1.34), 4c=2.39 (2.63), 4v=4.17 (4.51), 5x=2.78 (3.12), ac=2.53 (2.74), M=1.53 (1.68), C3F=1.00 (1.00).

Holotype ♂, China: Meichi, Zhejiang, 6. V. 1991 (IGFU).

Paratype: 1 ♂, same data as holotype (EHU).

Distribution. China: Zhejiang.

Relationship. This species closely resembles *Mi. (O.) bimaculata* (DE MEIJERE, 1908) in the structure of ♂ terminalia (cf. Figs. 3 F, G, OKADA, 1985), but differs from the latter in the diagnostic characters, *i.e.*, in *bimaculata*, aedeagus apically pointed, arb=4–6/1, sterno < 0.5, and C < 1.5.

Etymology. Referring to the surstylus with a falciform elongation below.

Genus *Liodrosophila* DUDA

Liodrosophila DUDA, 1922, Arch. Naturg., **88A** (4): 153; WHEELER & TAKADA, 1964, Ins. Micronesia, **14** (6): 222; OKADA, 1974: 32; BOCK, 1982: 100. Type species: *Camilla coeruleifrons* DE MEIJERE, 1911.

Diagnosis (modified from OKADA, 1974). Body usually glossy black; ocellar triangle (termed frontal shield by OKADA, 1974) very large, occupying most part of frons, quadrate, often with metallic sheen (cf. GRIMALDI, 1990); postocellar setae present, but minute; anterior reclinate orbital seta minute; palpus with 1 long apical seta; fore femur usually with a row of small spicules inside; abdomen as broad as thorax; oviscapt pointed apically.

Liodrosophila kimurai sp. nov.

(Figs. 15–18)

Diagnosis. Surstylus with 1 large, peg-like preniseta on inner surface (Fig. 15); cercus medially sparsely pubescent (Fig. 15); lateral arms of hypandrium pubescent (Fig. 16); paramedian setae present, widely separated from each other (Fig. 16).

♂, ♀. Head: Eye dark red. Ocellar triangle glossy, bluish black, broader than long. Frontal vitta displaced into very narrow strip between ocellar triangle and fronto-orbital plate (cf. GRIMALDI, 1990). Fronto-orbital plate glossy, orange brown, broadened above. Face glossy brown; carina high, narrow, but short. Clypeus black. Gena and postgena brownish black. Occiput black. Pedicel brownish gray, with 1 stout seta and several setulae; 1st flagellomere orange gray; arista with large terminal bifurcation. Palpus brownish black, somewhat flattened, with a few moderate setae laterally in addition to apical one.

Thorax: Postpronotal lobe brownish black, with 2 stout, subequal setae. Scutum glossy, maroon brown, paler and bluish on caudal half, highly convex, not pubescent. Scutellum velvety, brownish black. Thoracic pleura dark brown, ventrally darker. Acrostichal setulae in ca. 6 rows.

Wing hyaline. Crossveins clear. R_{2+3} slightly curved to costa at tip. R_{4+5} and M_1 parallel. Halter pale grayish white.

Legs pale yellowish brown; fore coxa and femur brownish black. Fore femur with ca. 10 to 15 spicules on inner surface. Apical setae on fore and mid tibiae; preapical dorsals on all tibiae. Fore 1st tarsomere slightly longer than 2 succeeding tarsomeres together; mid and hind 1st tarsomeres each slightly longer than 3 succeeding together.

Abdomen: Tergites entirely glossy black, somewhat purplish.

♂ terminalia: Epandrium (Fig. 15) broadened and truncate below, sparsely pubescent medially to dorsally, with ca. 4 setae medially to dorsocaudally and ca. 8 ventrally; anteroventral corner acute-angled. Surstylus (Fig. 15) narrow, distally slightly warped outward, apically somewhat pointed, with ca. 13 prenisetae in

concave row on caudal margin and 1 small spine apically; 2 apical prensisetæ much smaller. Cercus (Fig. 15) fused to epandrium, elliptical, with *ca.* 27 setæ. Apodeme of hypandrium (Fig. 16) somewhat triangular. Paramere (Fig. 16) minute, crescent, with *ca.* 2 setulæ. Aedeagus oval in ventral view (Fig. 16), somewhat oblong in lateral view (Fig. 17), subapically with hyaline, membranous, elongate process; apodeme slightly shorter than aedeagus.

♀ Terminalia: Oviscapt (Fig. 18) with *ca.* 17 marginal and *ca.* 5 lateral peg-like ovisensilla and 1 subapical and 3 apical trichoid ovisensilla.

Measurements: ThL=0.80 mm (0.59 in ♂, 0.80 in ♀), WL=1.59 mm (1.35 in ♂, 1.65 in ♀), WW=0.70 mm (0.56 in ♂, 0.76 in ♀).

Indices: arb=5 (5)/2 (2), FW/HW=0.51 (0.62), ch/o=0.24 (0.16), prorb=(0.76), rcorb=0.08 (0.14), vb=0.57 (0.72), dcl=0.65, sctl=0.69 (0.57), sterno=(0.29), orbito=0.33 (0.32), dcp=0.53 (0.55), sctlp=0.63 (0.71), C=1.37 (1.24), 4c=1.50 (1.83), 4v=1.90 (2.36), 5x=1.43 (1.60), ac=4.29 (3.70), M=0.50 (0.53), C3F=(0.54).

Holotype ♂, China: Hangzhou, Zhejiang, 26. IX. 1991 (IGFU).

Paratypes: China: 1 ♀, same data as holotype (IGFU); 1 ♂, Anfu, Jiangxi, 21. IX. 1992 (EHU).

Distribution. China: Zhejiang, Jiangxi.

Relationship. This species resembles *Lio. aerea* OKADA, 1956, in general appearance, but differs from the latter in the diagnostic characters, *i.e.*, in *aerea*, surstylus without peg-like prensiseta on inner surface, cercus and lateral arms of hypandrium not pubescent, and paramedian setæ absent.

Etymology. Patronym, in honor of Dr. Masahito T. KIMURA, Hokkaido University, who helped the senior author in collecting the specimens in Hangzhou.

Liodrosophila anfuensis sp. nov.

(Figs. 19–21)

Diagnosis. Aedeagus dorsally with short, stout claw (Fig. 21); lateral arm of hypandrium with apically pointed, small, triangular projection on inner margin (Fig. 20); surstylus with *ca.* 14 prensisetæ in concave row on caudal margin (Fig. 19).

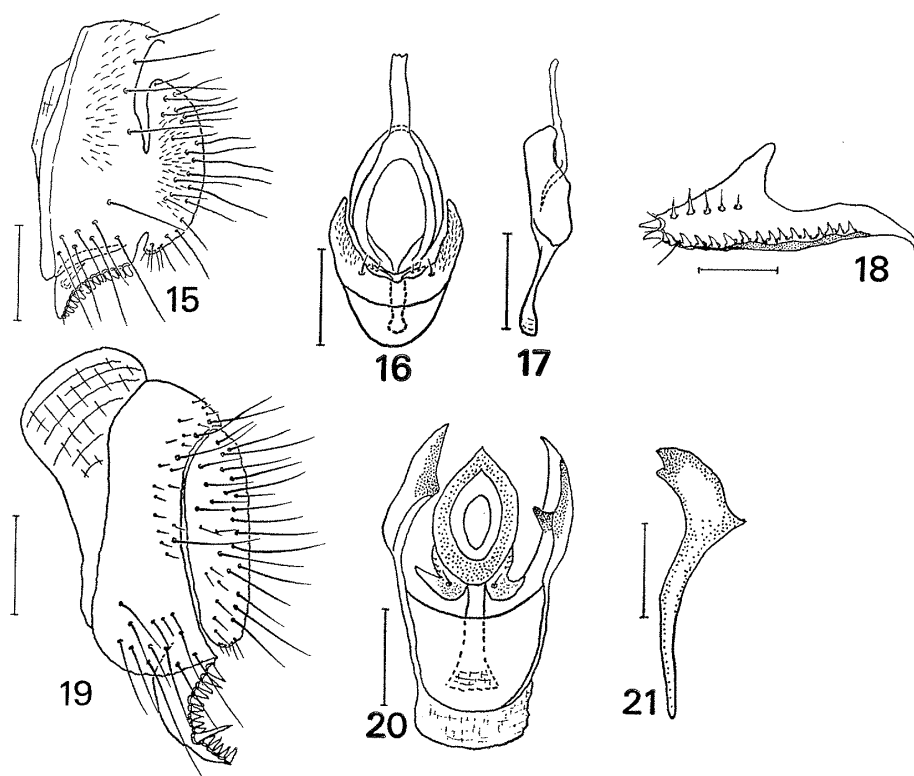
The following description refers to only differences from the foregoing species, *Lio. kimurai*.

♂. Head: Ocellar triangle dark brown. Face yellow. Gena orange brown. First flagellomere and palpus yellowish gray.

Thorax: Postpronotal lobe brown. Scutum maroon black, anteriorly paler. Thoracic pleura maroon brown. Acrostichal setulæ in *ca.* 8 rows.

Halter dark gray.

Legs pale yellow; all coxae and femora dark brown. Fore femur with *ca.* 9 spicules.



Figs. 15–18. *Liodrosophila kimurai* sp. nov.; 19–21, *Liodrosophila anfuensis* sp. nov. — 15, 19, Epandrium, surstylus and cercus; 16, 20, hypandrium, parameres and aedeagus (ventral view); 17, 21, aedeagus (lateral view); 18, oviscapt. (Scale-line=0.1 mm)

♂ terminalia: Epandrium (Fig. 19) with *ca.* 4 setae medially to dorsally near caudal margin and *ca.* 10 ventrally; apodeme well developed. Surstylus (Fig. 19) subapically with 1 stout preniseta on inner surface. Cercus (Fig. 19) separated from epandrium, large, somewhat oblong. Hypandrium (Fig. 20) basally somewhat quadrate; lateral arms not pubescent; paramedian setae minute, relatively close to each other. Aedeagus fusiform in ventral view (Fig. 20), apically somewhat bifid in lateral view (Fig. 21), subapically without membranous elongation; apodeme longer than aedeagus.

Measurements: ThL=0.83 mm, WL=1.59 mm, WW=0.80 mm.

Indices: arb=6/2, FW/HW=0.51, ch/o=0.28, rcorb=0.33, dcl=0.71, sctl=0.62, sterno=0.55, orbito=0.29, dcp=0.44, sctlp=0.50, C=1.72, 4c=1.52, 4v=2.00, 5x=2.25, ac=3.56, M=0.43, C3F=0.50.

Holotype ♂, China: Anfu, Jiangxi, 21. IX. 1992 (IGFU).

Distribution. China: Jiangxi.

Relationship. This species closely resembles *Lio. nitida* DUDA, 1922, in the ♂ terminalia and general appearance, e.g., the coloration of legs and halter, but differs from the latter in the diagnostic characters, *i.e.*, in *nitida*, aedeagus dorsally without

claw-like projection, lateral arm of hypandrium with apically serrated, small expansion on inner margin, and surstylus with *ca.* 10 prenisetae on caudal margin.

Etymology. Pertaining to the type locality.

Genus *Mycodrosophila* OLDENBERG

Mycodrosophila OLDENBERG, 1914, Arch. Naturg., **80A** (2): 4; WHEELER & TAKADA, 1963, Ann. ent. Soc. Am., **56**: 392; 1964, Ins. Micronesia, **14** (6): 199; BOCK, 1980, Aust. J. Zool., **28**: 262; 1982: 124. Type species: *Amiota poecilogastra* LOEW, 1874.

Diagnosis (modified from BOCK, 1982). Arista usually with single ventral branch; anterior reclinate orbital seta small or fine; facial carina usually well developed; subvibrissal seta not differentiated; scutum highly convex, usually darkly colored, glossy; scutellum broadly rounded, dark, velvety or subshining; anterior dorsocentral seta minute or absent; basal scutellar seta short or fine; portion of costal vein proximal to subcostal break usually thickened and blackened as costal lappet; frons usually silverly shining, especially in medial portion, when viewed at acute angles.

Subgenus *Mycodrosophila* OLDENBERG

Mycodrosophila s. str.: OKADA, 1986: 299.

Diagnosis (after OKADA, 1986). Costal lappet well developed.

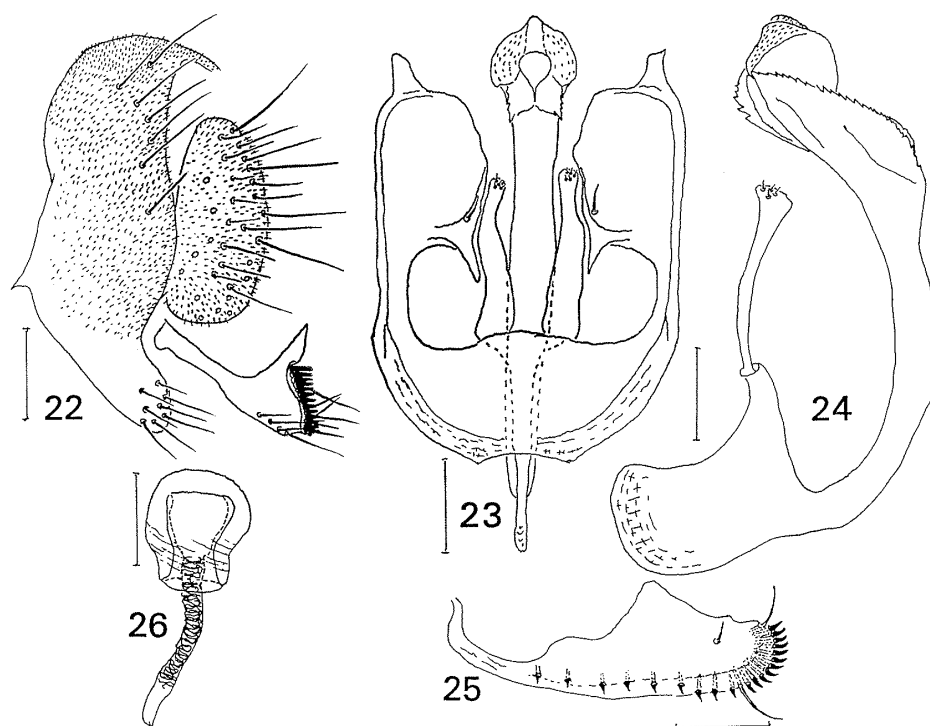
Mycodrosophila (*Mycodrosophila*) *huangshanensis* sp. nov.

(Figs. 22–26)

Diagnosis. Distiphallus (Figs. 23, 24) bilobed, apically vertically much dilated; apicodorsal lobes dorsally fused to each other, apically pubescent; apicoventral lobe serrate on margin; lateral lobe serrate on dorsal margin. Oviscapt (Fig. 25) apically round, somewhat truncate, with *ca.* 20 marginal peg-like ovisensilla and 1 ultimate marginal, 1 lateral and 1 subapical trichoid ovisensilla.

♂, ♀. Head: Eye dark red. Frons flat, reddish brown, anteriorly paler and with a few minute interfrontal setulae; fronto-orbital plate and ocellar triangle dark brown. Face reddish brown; carina high, broad below. Clypeus broad, brownish black. Gena dark brown, paler around caudoventral corner. Vibrissa prominent. Postgena grayish yellow. Occiput dark brown. Pedicel grayish brown; 1st flagellomere gray. Palpus grayish yellow, somewhat flat, with 1 apical prominent, a few lateral and several small ventral setae.

Thorax: Postpronotal lobe grayish brown, with *ca.* 4 setae and several setulae; lower 2 setae longer and stout. Scutum glossy black, paler on anterior margin. Anterior dorsocentral setae very small. Acrostichal setulae in *ca.* 16 irregular rows. Scutellum velvety black. Basal scutellar setae slightly convergent; apicals crossed



Figs. 22–26. *Mycodrosophila (Mycodrosophila) huangshanensis* sp. nov. — 22, Epandrium, surstylus and cercus; 23, hypandrium, parameres and aedeagus (ventral view); 24, paramere and aedeagus (lateral view); 25, oviscapt; 26, spermatheca. (Scale-line=0.1 mm)

each other. Mesopleuron entirely whitish yellow, except for dark brown dorsal margin of anepisternum.

Wing hyaline, with cloud below subcostal break and extending beyond R_{2+3} . C_1 setae not differentiated. Veins brownish yellow; crossveins clear. R_{2+3} nearly straight; R_{4+5} and M_1 distally slightly convergent. Halter knob largely black, except for white lateral to apical margin; base and stem white.

Legs entirely whitish yellow. ♂ fore leg with a row of long setae on underside of 1st tarsomere, but mid leg without long setae. Apical setae on fore and mid tibiae; preapical dorsal on hind tibia. Fore and mid 1st tarsomeres each slightly longer than 3 succeeding tarsomeres together; hind 1st tarsomere slightly shorter than the rest together.

Abdomen: Tergites yellow; 2nd with medially interrupted, laterally protruded, black caudal band; 3rd and 4th each with medially and laterally protruded, black caudal band; 5th with medially protruded, black caudal band; 6th entirely yellow in ♂, with 1 pair of dark brown patches laterocaudally in ♀. Sternites whitish yellow.

♂ terminalia: Epandrium (Fig. 22) whitish yellow, pubescent caudodorsally, with *ca.* 7 setae near caudal margin of middle to dorsal part and *ca.* 8 setae on distal part of narrow ventral lobe. Surstylus (Fig. 22) proximally narrow, distally some-

what triangular and with triangular expansion dorsally, *ca.* 13 prensisetae on caudal margin, *ca.* 4 setae ventrally and *ca.* 7 setae on inner side. Cercus (Fig. 22) separated from epandrium, oval, entirely pubescent, with *ca.* 31 setae. Hypandrium (Fig. 23) somewhat quadrate, with large, anteriorly widened, median notch and 1 pair of paramedian setae near inner margins submedially. Paramere (Figs. 23, 24) elongate, apically with *ca.* 4 setulae. Aedeagus (Figs. 23, 24) long, gently curved ventrad; aedeagal guide well developed, apically contiguous to base of paramere; aedeagal apodeme very broad in lateral view, *ca.* 1/3 length of aedeagus.

♀ terminalia: Oviscap (Fig. 25) elongate, mediodorsally broadened; antero-ventral bridge narrow, short. Spermatheca (Fig. 26) bulb-shaped, submedially slightly obliquely wrinkled; introvert deep, broad, submedially slightly wrinkled; duct distally much broadened.

Measurements: BL=(2.87 mm in ♂, 2.71–3.06 mm in ♀), ThL=1.32 mm (1.39 in ♂, 1.32–1.40 in ♀), WL=2.61 mm (2.71 in ♂, 2.55–2.89 in ♀), WW=1.17 mm (1.32 in ♂, 1.23–1.39 in ♀).

Indices: arb=4 (4)/1 (1), FW/HW=0.38 (0.45–0.50), ch/o=0.19 (0.13–0.21), prorb=0.93 (0.91–0.96), rcorb=0.21 (0.20–0.23), vb=0.31 (0.31–0.42), dcl=0.27 (0.24–0.32), sctl=0.57 (0.58), sterno=0.45 (0.52–0.61), orbito=0.66 (0.50–0.78), dcp=0.19 (0.09–0.16), sctlp=0.68 (0.57–0.73), C=1.67 (1.73–1.90), 4c=1.48 (1.27–1.35), 4v=2.17 (1.99–2.10), 5x=2.30 (1.47–1.75), ac=3.47 (3.28–3.33), M=0.79 (0.61–0.71), C3F=0.70 (0.66–0.71).

Holotype ♂, China: Huangshan, Anhui, 30. VIII. 1991, from cliff shelter (IGFU).

Paratypes: 1 ♂, 2 ♀, same data as holotype (EHU, IGFU).

Distribution. China: Anhui.

Relationship. According to OKADA's (1986) key, this species goes to *My.* (*My.*) *biceps* KANG, LEE et BAHNG, 1966, and somewhat resembles *My. melanopleura* SUNDARAN et GUPTA, 1991, in lateral view of aedeagus, but is very specific among *Mycodrosophila* species in the morphology of distiphallus and oviscap as mentioned in the diagnosis.

Etymology. Pertaining to the type locality.

***Mycodrosophila (Mycodrosophila) poecilogastra* (LOEW, 1874)**

Amiota poecilogastra LOEW, 1874, Z. Gesam. Naturw., **43**: 419.

Mycodrosophila poecilogastra: OLDENBERG, 1914, Arch. Naturg., **80A** (2): 6; OKADA, 1956, Syst. Study Drosophilidae Japan: 51.

Drosophila johni POKORNY, 1896, Mitt. Naturw. Ver., Troppau, **2**: 63.

Mycodrosophila arcuata CHEN, SHAO et FAN, 1989: 384. **syn. nov.**

Specimens examined. China: 9 ♂, 5 ♀, Mt. Emei, Sichuan, 550–800 m alt., 18. VII. 1992; 1 ♂, Babaoshan, Guangdong, 12. XI. 1989.

Distribution. Europe, Iran, Russian Far East, Korea, Japan, China: Liaoning, Sichuan (n. loc.), Hunan, Guangdong.

Remarks. Replying to our request, Emeritus Prof. Toyohi OKADA of Tokyo Metropolitan University examined *arcuata* 1 ♂ and 1 ♀ paratype specimens deposited in NSMT comparing with some specimens of *poecilogastra* and confirmed that the former is conspecific to the latter.

***Mycodrosophila (Mycodrosophila) koreana* LEE et TAKADA, 1959**

Mycodrosophila koreana LEE et TAKADA, 1959: 94.

Mycodrosophila liliacea CHEN et OKADA, in CHEN *et al.*, 1989: 388. **syn. nov.**

Specimens examined. China: 1 ♂ paratype of *liliacea*, Guilin, Guangxi, 25. V. 1984 (NSMT); 8 ♂, 4 ♀, Jixi, Anhui, 11–15. VII. 1990; 1 ♂, 1 ♀, Mt. Emei, Sichuan, 550 m alt., 16, 18. VII. 1992. Japan: 1 ♂, Fukuoka, Kyushu, 1. VIII. 1980.

Distribution. Japan, Korea, China: Anhui (n. loc.), Sichuan (n. loc.), Hunan, Guangxi.

Remarks. CHEN *et al.* (1989) designated the difference in the morphology of ventral part of epandrium between *koreana* and *liliacea*, *i.e.*, pointed apically in the former (cf. Fig. 3 in LEE & TAKADA, 1959) but obtuse below in the latter (cf. Fig. 3 E in CHEN *et al.*, 1989), as a diagnostic character. However, it must be due to the difference in the direction of view. In fact, Japanese specimens of *koreana* have the epandrium which looks obtuse below in ventrolateral view.

Acknowledgements

We wish to thank Emeritus Prof. T. OKADA of Tokyo Metropolitan University, who examined some type specimens himself replying to our request and gave us valuable comments on some synonyms, simultaneously allowing the junior author to study those important specimens on loan. Our sincere thanks are also due to Prof. O. KITAGAWA of Tokyo Metropolitan University for his general interest and support to this study, Prof. T.-X. PENG of the Guangdong Institute of Entomology for giving us the information on the date of publication for *A. pseudopi*, and the following colleagues for their help in collecting some studied specimens: Dr. X.-j. WANG of the Institute of Zoology, Academia Sinica, Beijing, Dr. H. WATABE of Hokkaido University of Education and Dr. M. T. KIMURA of Hokkaido University. This work was partly supported by a Grant-in-Aid for Overseas Scientific Survey from the Ministry of Education, Science and Culture, Japan (No. 03041068).

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(Received April 1, 1994; Accepted May 24, 1994)